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(54) **Upright type vacuum cleaner.**

(57) The broom-like aspirator has a thorough shell, wherein are harmoniously distributed and/or easily accessible the service and control means (8, 8', 8''). At least these are placed on the handle (3') in order to be substantially controllable by the finger of the same hand seizing the handle. The operating members are distributed along a substantially triple length to reduce correspondingly the aspirator cross-section and provide penetration to the aspirator and placing the motor (4) closer to the brush (0). The shell is continuous and substantially subdivided into four pieces (1, 2', 2'', 3). The means (8) of control, with inherent buttons and the like, are placed within the shelled handle (3), whereby the interface body (2) - handle (3) is determined towards the aspiration mouth (1), providing a longer handle (3) and designing the electric system (6) in two sections (6', 6''), interfaced by a connector (60).

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The present invention relates to a vertical aspirator, of the so said broom - like kind, having a complete balanced shell, wherein are harmoniously distributed and or easily accessible the service and control means, wherein at least the driving means may be controlled by the same hand controlling the aspirator. The present invention relates also to the process and means for providing the members of the complete shell.

At the present state of the art, the so said broom - like vertical aspirators have, generally, a structural attitude centralized about the middle of the stick and outside of such middle part, placed about at a half of the stick, did not exist space available to arrange and distribute the functional members. Such concentration, which was a limitation of the longitudinal extension, penalized the transverse encumber or cross section of the apparel, rendering it unsuitable to penetrate under the furniture. This penetration for being possible, requires that the cross-section is not excessive or that correspondingly the body of concentration be relatively far from the brush holder end or the like, which must penetrate under the furniture. This means at least four drawbacks:

1) to create the necessary distance between the brush and the concentration body a tubular extension is to be included; 2) the concentration body (obviously not only the space but even the weight) is placed close to the handle in conditions scarcely or advantageously. Indeed the arrangement is a second class lever wherein the weight arm is scarcely shorter than the power arm; 3) the aspiration power remotely applied loses effectiveness; 4) the hand drive had to be necessarily placed on the same concentrated body, i.e. in uncomfortable conditions for the operator who was compelled to supply with his second hand. Thus such concentration involved quite often the operator intervention with both hands or detaching one of his hands from the ideal position of task. Such lack of comfort persuaded the operator to omit the control due also in view of the weight to be carried along.

The invention, as claimed, is intended to remedy these drawbacks. The inventor, with ingenious perception, has conceived a vertical aspirator, of the so said broom - like kind, having a complete balanced shell, wherein are harmoniously distributed and or easily accessible the service and control means, wherein at least the driving means may be controlled by the same hand controlling the aspirator. The distribution of the functional members along a substantially triple length reduces correspondingly the cross-section and provides penetration to the aspirator. Even without the provision of a tubular extension, which limit the aspiration power, it is possible to place the driving motor closer to the brush. In these conditions the second class lever is provided with a longer power arm with respect to the weight arm. The substantial continuity of the body and the consistency of

its cross - section allows the localization of the controls immediately close to the handle of the apparatus. Thus the saving of energy and fatigue are remarkable. On the other hand the condition for realizing the advantages was to provide a body which as unit and as particular is realizable at reduced costs, with ample possibilities and advantages even for ornamental purposes. For this reason the structural pieces have been provided with shapes and in a reduced number (four, plus the control panel and the grid) easily removable from molds possibly cheap and simple with a reduced number of connections (8 screws).

One way of carrying out the invention is described in detail below, with reference to the drawings, which illustrate a specific embodiment, in which.

Figure 1 is the perspective, exploded, view, of the broom - like aspirator in accordance with the present invention.

Figure 2 is the longitudinal cross-section, of the broom - like aspirator of figure 1, which is mounted.

Figure 3 is the schematic side view, of the movement to be performed to penetrate the aspirator under the furniture; this may happen in conditions diametrically opposed from both sides. The upright position, schematic too, is shown in dashed lines.

Figure 4 is a graph of distribution of the active and passive forces controlling the broom - like aspirator. In such graph are compared the aspirator according to the invention (in continuous lines) which does not need of a tubular extension between the brush and aspiration mouth and a conventional aspirator without tubular extension aspirator (thin dashed line) and with tubular extension (thick dashed lines) representing the most disadvantageous conditions.

Figure 5 is the schematic, symbolic view, of a mold for injection molding the most complicated section of the aspirator body.

Figure 6 is the perspective view, in a slightly enlarged scale, of the essential sections of the aspirator according to the present invention, taken from the top.

Figure 7 is substantially a repetition of figure 6, but taken from the bottom and from an opposite or alternative position.

Figure 8 is a detailed, perspective, exploded, view, of the components regarding the assemblage of the motor-aspirator according to the present invention.

Figure 9 is the perspective view, partially broken of the motor-aspirator and inherent details of figure 8, duly assembled.

Referring now to the figures of the drawings, a broom - like aspirator, conventionally comprises, an aspiration mouth 1, a central body 2 and a handle 3. All the conventional aspirators comprise, in the central body 2, the dust collecting room 20 and the electric motor 4 of aspiration; the dust collecting room 20,

of a number of conventional aspirators, is provided with an arrangement for holding and practicing a dust collecting pocket 50. In the central body 2 of the conventional broom - like aspirators, are installed the electric circuit 6, possibly the card or board 7, the means 8 of control, such as buttons and the like, emerging outside. The handle 3 of the conventional broom - like aspirators is substantially tubular extension, having exclusively seizing functions and in general is removable for reasons of encumber, stocking and packaging. The trend was to keep the handle 3 relatively short, since considered the worst section both aesthetically and functionally and this also for providing space to the dust collecting room 20. In this fashion the centre of gravity of the apparatus was placed in the upper part thereof. Another reason why the handle was kept relatively short, was that being the means 8 of control, placed on the central body 2 it was wanted that the grip of the handle 3, for reasons of comfort, was close to the control means 8. The need to adequate the aspiration speed, to the particular operating moment, was frequent, but the lack of comfort, the consume of time, and the exigency of using both hands, limited remarkably the interventions. Thus lacking aspirations could occur, with reduced efficiency or abounding aspirations with excessive load and wearing of the motor 4 which is the most delicate member of the apparatus, being called to operate at the limit of maximum speed.

According to the invention, a section of the electric circuit 6, the means 8 of control, with inherent buttons and the like, of which it will be spoken in the following, are placed within the shelled handle, of which it will be spoken in the following too. As a result the interface body 2 - handle 3, results to be localized closer to the aspiration mouth 1. To obtain this, the electric system is provided in two sections 6', 6'', interfaced by a connection 60. Thus, the length of the handle 3 is, naturally, maximized and the buttons 8 of control are advantageously placed so as to be easily controllable, in any moment, without detaching the control hand from the grip 3' of the aspirator handle bar. Another reason why the handle 3, according to the present invention, is kept relatively long, is to increase the arm ratio power/weight, this ratio is important for a good operation of the aspirator, rendering the latter more advantageous; in fact the fulcrum (brush 0) remains in the same position. Moreover the shelled attitude of the handle 3 or monohandle-bar, which is harmonized functionally and aesthetically with the aspirator body 2 and to the whole aspirator, does not impair its length. Thus, according to the invention, there is the possibility to permanently adjust, through the control of the buttons 8', 8'', the aspiration speed to the particular operating moment, without consume of time and energy, or the need of using both hands to provide the control, keeping the aspiration degree always optimal, in order to provide the

maximum efficiency with the minimum wear of the electric motor 4. Designing the aspirator structure and sharing the available volumes it was established as space to be devoted to the dust collection that considered congruous of 1,1 dm<sup>3</sup> of the bag 50 and a longitudinal sharing of the hollow of the body 2 in two sections 2' and 2''. The sections 2', 2'' have a common wall 25. They have also in common, but with complementary effect, three pairs of protuberances 02, 02'; 002, 002'; 122, 122' and a single protuberance 002'', 002'''; all said protuberances being bored. The holes in said protuberances are complementary, since, on one side, pass through (02, 002, 122, 002''') and on the other side (02', 002', 122', 002''') are dead, to receive, each, a self tapped screw, respectively: 222, 222', 222'', 222'''. Two of the pairs of protuberances (02, 002) and the single protuberance 002'' are hollow, while the third pair 122, 122' is external and has the protuberances 122 of one side only which are simply bored through. These arrangements have allowed not only to take fully advantage from the standard dimensions of the brush 0, i.e. of the distance of the axis from the plane of rest of the brush, but even to spare encumber in cross-section. In fact, the body 2 of the aspirator has a cross-wise encumber substantially symmetrical of 124 mm x 124 mm. This attitude, as shown in figure 3, thanks to the correspondence between the encumber of the brush 0 and the encumber of the body 2, once put in sympathetic position, can penetrate under the furniture, and the like even if they are scarcely lifted from the floor (e.g. 125 mm). From this structuration results a reduced consume of energies for operating the aspirator, due firstly to the variation of the arm ratio (power/weight of the second class lever), secondly due to the lightening provided with the substitution of parts made of metal, with parts made of plastic material and thirdly due to the lightening of the same parts made of plastic material obtained by the decomposition in stronger parts. These effects are better shown in figure 4, wherein are compared the aspirator according to the invention (curve I) which does not need of tubular extension (not shown) between the brush 0 and aspiration mouth 1 and a conventional aspirator without tubular extension, line S, and with tubular extension, line P, which is the condition more disadvantageous.

Very important member of the arrangement is, as said, the handle 3 which is made of a single piece of plastic material. In figure 5 is schematically shown a mold 03 for injection molding the handle 3. The handle 3 is comprised by a tubular, bevelled, member 3', bent at 3'' by a very obtuse angle. Such features of the handle 3 involve problems to remove it from the mold 03. To obviate such problems the mold 03 is comprised by the sections 03', 03'' and is equipped by two axially removable plugs 32, 33. In the handle member 3' are provided three holes 34, 35, 36, and one slot

37, to receive the control panel 80, of which it is spoken later on.

The aspirator, according to the present invention, will now be described, in detail and as a whole. The aspiration mouth 1 is comprised by a member of plastic material, in the form of funnel, having hollow body 1' and a tubular extension 1". The body 1' is reasonably complex and is provided with a groove 10, adapted to engage an hook 020, of which it will be spoken later on. The body 1' is provided also with an opening 11, which is complementary with the tapering 21. Moreover it is provided with an indentation 12, to receive a button 012, acting as a latch. In the coupling between the body 1' and the bottom section of the body 2 i.e. between the members 10, 11, 12, from one side and the members 020, 21, 22, from the other side, is provided a gasket 021, which limit the room 20 to receive the bag 50. To limit upwardly the dust collecting room 20, there is a wall 25, which is provided with a pair of guides 25', 25", to receive a filter 52. Instead, at the top, to cover the opening in the wall 25, there is a grid 54 which serves to protect the user's hands, when he opens the dust collecting room 20, e.g., during the substitution of the bag 50; on the grid 54 it is applied a coating 4", shaped as the inside of the body 2, which is adapted to hold the motor-aspirator 4' (figures 8, 9, 1). Of course the motor-aspirator 4' is connected to the electric net, in accordance with the modality to be described in the following; however, mechanically, it is hung by two half-supports 40, 41 and by an elastic bearing 42. The half-support 40 is adapted to receive therein the card 7' having nine terminals (07, 07', 07", 17', 17", 71, 71', 71", 71""), to be connected to the electric system and to the same motor 44', as it will be explained later on. On the body 2 of the aspirator, to release the air, in order that it may leave the motor-aspirator 4', a grid 22" is provided, which is in one piece with the shell 2" of the body 2. This grid 22" is covered by a filter 43 and by a back-grid 43'.

The electric system will now be described in details and the general assemblage will be described thereafter. The connection of the aspirator to the net is made through the plug 06, which gives current to the cable 06', which enter into the body 2 through the hole 26, where it has the poles 66, 66' to be connected with the contacts 71', 71"" of the card 7'. To the contacts 17', 17"" of the card 7' are additionally connected the two poles 44, 44' of the motor 4'. To the contacts 71, 71"" are connected the two poles 55, 55' of the alarm 57, indicating that the dust collecting bag is full. To the three contacts 07, 07', 07"" are connected the three poles 76, 76' 76", which supply current to the wires 6', which extend to the handle 3; respectively two of them to the switch 8' and one of them to the potentiometer 08.

The arrangement is designed in such a way that by fastening substantially three pairs of screws 222,

222', 222" and a single screw 222""', the body 2 of the aspirator is operationally assembled. In particular, the screws 222 are passed through the hollow protuberances 02 and screwed within the protuberances 02'; the screws 222' are passed through the hollow protuberances 002 and screwed within the protuberances 002'; the screw 222"" is passed through the hollow protuberance 002"" and screwed into the protuberance 002"" and the screws 222" are passed through the outer hollow protuberances 122, and screwed within the protuberances 122'.

However prior to use the screws 2 it is necessary to provide a pre-matching as shown in the figures 8 and 9. The device to be pre-matched comprises substantially the motor-aspirator 4', the half-supports 40, 41, the elastic bearing 42 and the shells 2' and 2". The motor-aspirator 4', comprises, in a fashion per se known, a cylindric extension 04 which can be used to fasten the motor-aspirator 4'. However, the diameter of this extension may be different in relation to the different manufacturer who has produced it. The elastic bearing 42, per se known, is provided with a hole 42', to receive the extension 04 of the motor-aspirator 4'. In accordance with an important feature of the present invention the elastic bearing 42, is provided with four orthogonal sector-like slots 42", adapted to receive the two triads of ribs 40', 41' provided respectively by the half-supports 40, 41. In accordance with a preferred embodiment of the present invention, the hole 42', provided in the elastic bearing 42, is comprised by two steps, i.e., for one half of its thickness it has a first diameter and the remaining thickness a second diameter different from the first, wherein such two diameters correspond to two motors of different construction, i.e. corresponding to the diameter of the extensions 04 of the two motor-aspirators provided by the manufacturer, whereby both during manufacturing and during the use there are no problems of interchangeability. In fact, it will be sufficient to apply the elastic bearing 42 with the corresponding hole adjacent to the motor-aspirator 4'. The half-supports 40, 41, in addition to have the ribs 40', 41', provided respectively by the half-supports 40, 41, are provided with coupling indentations 102, 102', 102'', for fitting with the respective protrusions, whereby to simplify the coupling and pre-assemblage. The ribs 40', 41' have dimensions such as to be received by the slots 42", of the elastic bearing 42, with a soft fastening, since the fixing provided by the bearing 42 to the motor-aspirator 4' is radial and elastic. Regarding the handle 3 it is assembled autonomically substantially through the following operations: preliminarily the switch 8' is mounted on the panel 80; the cable 6' on the potentiometer 08; the potentiometer 08 is then mounted it too on the panel 80 to comprise a unit 8. The unit 8 is thus assembled, to provide a joint within the handle 3', leaving the buttons 8' and 08 to emerge from the front side and the cable 6' from

the bottom of the tube 3. Then the cable take up 30 is jointed to the hole 36. The handle 3 is thus ready to be connected, electrically and mechanically to the body 2. For both connections there are two possibilities. The connexion 60 may be direct and definitive, through the wires 6' or provided through a male - female coupling with double safety cablepress and anti-release device. To end the production, in the first case the handle 3 is packaged parallel to the body 2, while in the latter case may be packaged in any other way or separately. For beginning to use the apparatus it would be necessary to assemble only the body 2 and the handle 3 in the first case, while, in the second case, it would be necessary to provide both the electric and mechanic connexion. The mechanic assembling is provided with a bolt 9 comprised by the screw 9' and by the nut 9". Regarding the aspiration mouth 1, the bag 50 to collect the dust and the brush 0, the conventional rules are followed.

### Claims

1 Broom-like aspirator, characterized in that it comprises one or more of the following particularities:

a) a thorough shell, wherein are harmoniously distributed and or easily accessible the service and control means, wherein at least the control means are placed on the handle (3') in order to be substantially controllable by the finger of the same hand seizing the handle grip and controlling the aspirator.

b) The operating members are distributed along a substantially triple length to reduce correspondingly the aspirator cross-section and provide penetration to the aspirator and placing the motor (4) closer to the brush (0) rendering more advantageous the arm ratio power/weight.

c) comprises a continuous shell subdivided into four pieces, plus the control panel and the grid easily removable from their molds and simple, with possibility of assemblage of its members with a reduced number of fastening members (8 screws).

d) a section of the electric circuit (6), the means (8) of control, and its buttons, are placed in the handle (3), in order that the interface body (2) - handle (3) is situated towards the aspiration mouth (1) providing a longer handle (3), and designing the electric system (6) in two sections (6', 6''), interfaced by a connector (60).

e) the buttons (8) of control are placed close to the fingers and thus, permanently controllable, without detaching the respective hand from the grip (3') of the aspirator handle.

2. Aspirator, as claimed in claim 1, characterized in that the dust collecting room (20) or room the bag (50) is of 1,1 dm<sup>3</sup> with a longitudinal subdivision of the

body (2) in two sections (2' and 2''), wherein the sections (2, 2') of the body (2) of the shell have, in common: a wall (25), three pairs of protuberances (02, 02'; 002, 002'; 122, 122') and a single protuberance (002'', 002'') all said protuberances being bored, wherein the holes in said protuberances are complementary since on one side pass through (02,002,122,002'') and on the other side (02', 002', 122', 002'') they are dead to receive, each, respectively, a self tapping screw (222, 222', 222'', 222''), wherein two of the protuberance pairs (02, 002) and the single protuberance (002'') are internal and hollow, while the third pair (122, 122') is external and has the protuberances (122) on one side only, all said protuberances being bored through, wherein the body (2) of the aspirator has a crosswise encumber of 124 x 124 mm.

3. Aspirator, as claimed in claim 1, characterized in that the handle (3') is comprised by a tubular bevelled member (3') bent (at 3'') by a very obtuse angle and made of a single piece of plastic material, obtained with a mold (03) for injection molding, the mold (03) being comprised by the sections (03', 03'') equipped by two axially removable plugs (32, 33) and adapted to provide, in the handle (3'), the holes (34, 35, 36), and the slot (37) for the control panel (80).

4. Aspirator, as claimed in claim 1, characterized in that the aspiration mouth (1) is comprised by a member of plastic material, in the form of funnel, having a hollow body (1') and a cylindric tubular extension (1''), which is provided with a slot (10) for coupling with a hook (020), and an opening (11), complementary to a tapering (21) as well as having an indentation (12) to receive a latch-like button (012), wherein between the body (1') and the bottom section of the body (2) i.e., between the members (10, 11, 12), from one side and the members (020, 21, 22), from the other side, is provided a gasket (021).

5. Aspirator, as claimed in claim 1, characterized in that to limit upwardly the dust collecting room (20) there is a wall (25), with a pair of guides (25', 25'') for a filter (52), for covering an opening in the wall (25), there is a grid (54) of protection for the access to the dust collecting room (20); on the grid (54) is applied a coating (4''), to hold the motor-aspirator (4').

6. Aspirator, as claimed in claim 1, characterized in that the motor-aspirator (4') is connected electrically to the system (60) and, mechanically, is hold, by two half-supports (40, 41) and by an elastic bearing (42), this is adapted to receive therein, the card (7'), having nine terminals (07, 07', 07'', 17', 17'', 71, 71', 71''), to be connected to the electric system (60) and to the same motor-aspirator (4'), on the body (2) of the aspirator, is provided a grid (22''), which is in one piece, with the shell (2'') of the body (2), said grid (22'') having a filter (43), and a back-grid (43').

7. Aspirator, as claimed in claim 1, characterized in that the connection of the aspirator to the net is

made through the plug (06), which gives current to the cable (06'), which enter into the body (2) through the hole (26), wherein it comprises the poles (66, 66') to be connected with the contacts (71', 71'') of the card (7'), the contacts (17', 17'') of the card (7') being connected as follow: the two poles (44, 44') of the motor (4'), to the contacts (71, 71'''), the two poles (55, 55') of the alarm (57) (indicating that the dust collecting bag is full) and to the three contacts (07, 07', 07'') are connected the three poles (76, 76' 76'') which supply current to the wires (6'), which extend to the handle (3) respectively two of them to the switch (8') and one of them to the potentiometer (08).

8. Aspirator, as claimed in claim 1, characterized in that by fastening three pairs of screws (222, 222', 222'') and a single screw (222''') are assembled functionally: the body (2) of the aspirator: the screws (222) are passed through the hollow protuberances (02) and screwed within the protuberances (02'); the screws (222') are passed through the hollow protuberances (002) and screwed within the protuberances (002''); the screw (222''') is passed through the coated protuberance (002''') and screwed into the protuberance (002''') and the screws (222'') are passed through the outer hollow protuberances (122), and screwed within the protuberances (122').

9. Aspirator, as claimed in claim 1, characterized in that the assemblage of the body (2) occurs previous approaching and joining between motor-aspirator (4'), half-supports (40, 41), elastic bearing (42), and shells (2' and 2''), wherein the hole (42') provided in the elastic bearing (42) is comprised by two steps, i.e. for one half of its thickness it has firsta diameter and the remaining thickness a second diameter, different from the first and wherein the half-supports (40, 41) in addition to have the ribs (40', 41'), are provided with seats (102, 102', 102'', 102''') of coupling, said ribs (40', 41') being received by slots (42'') of the elastic bearing (42) with a soft fastening, which is elastic in radial direction.

10. Aspirator, as claimed in claim 1, characterized in that for the assemblage of the handle (3) are mounted in succession: the switch (8') on the panel (80); the cablage (6') on the potentiometer (08); the potentiometer (08) is mounted on said panel (80) to comprise a unit (8) to be jointed by pressure to the handle (3'), eventually the cable take up (30) is jointed to the hole (36), the connexion (60) being direct through the wires (6'), the assemblage between the body (2) and the handle being provided through a male - female coupling with double safety cablepress and antirelease device, eventually the mechanic assembling being provided with a bolt (9) comprised by the screw (9') and by the nut (9'').

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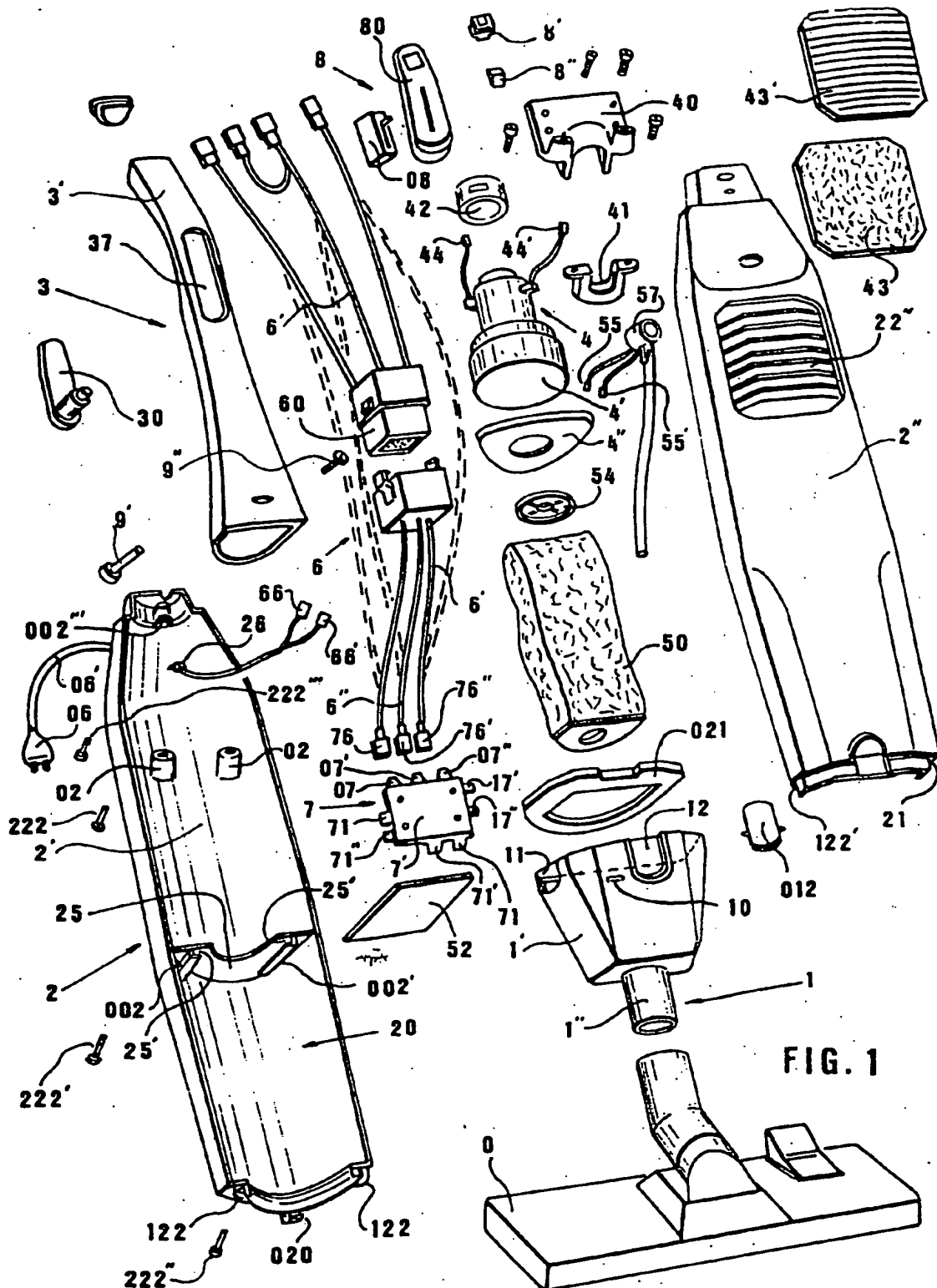
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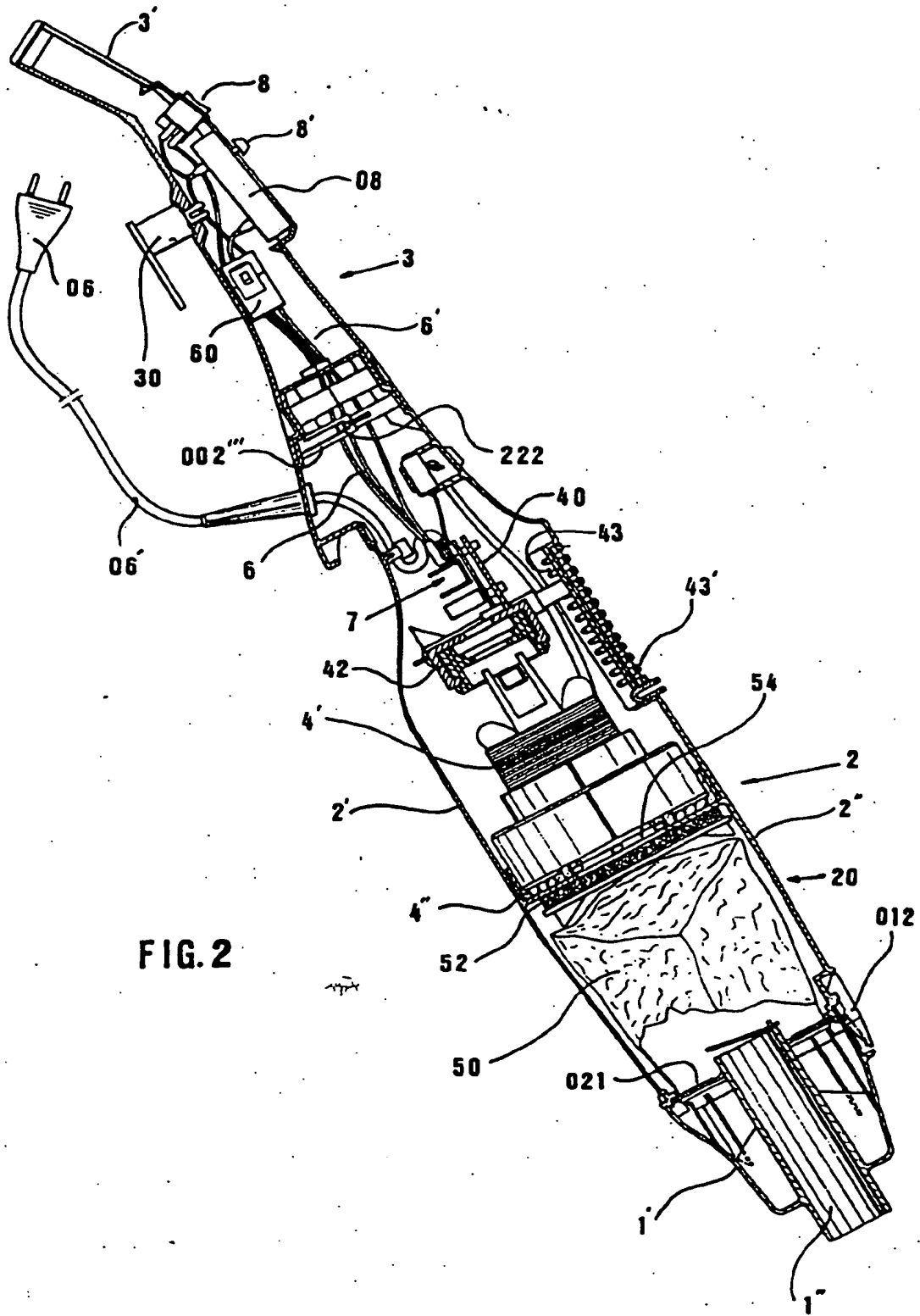


FIG. 2

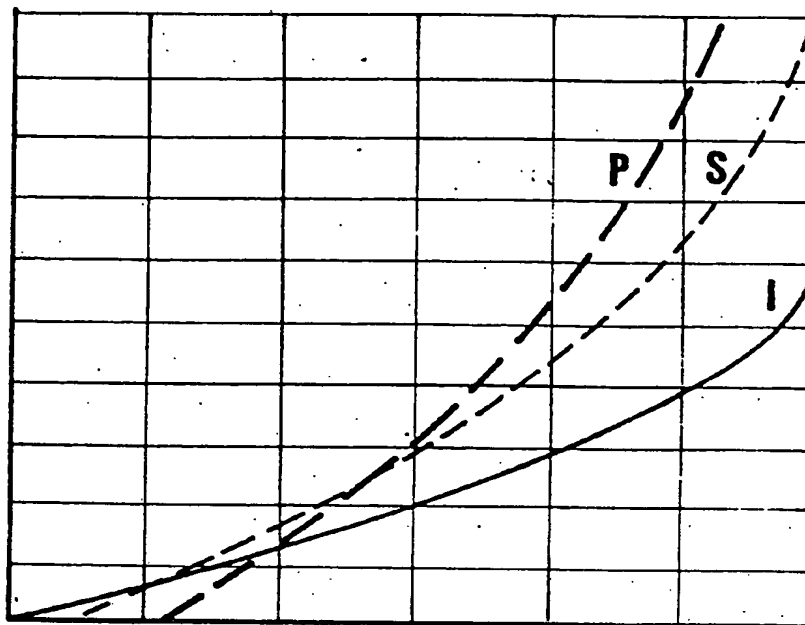


FIG. 4

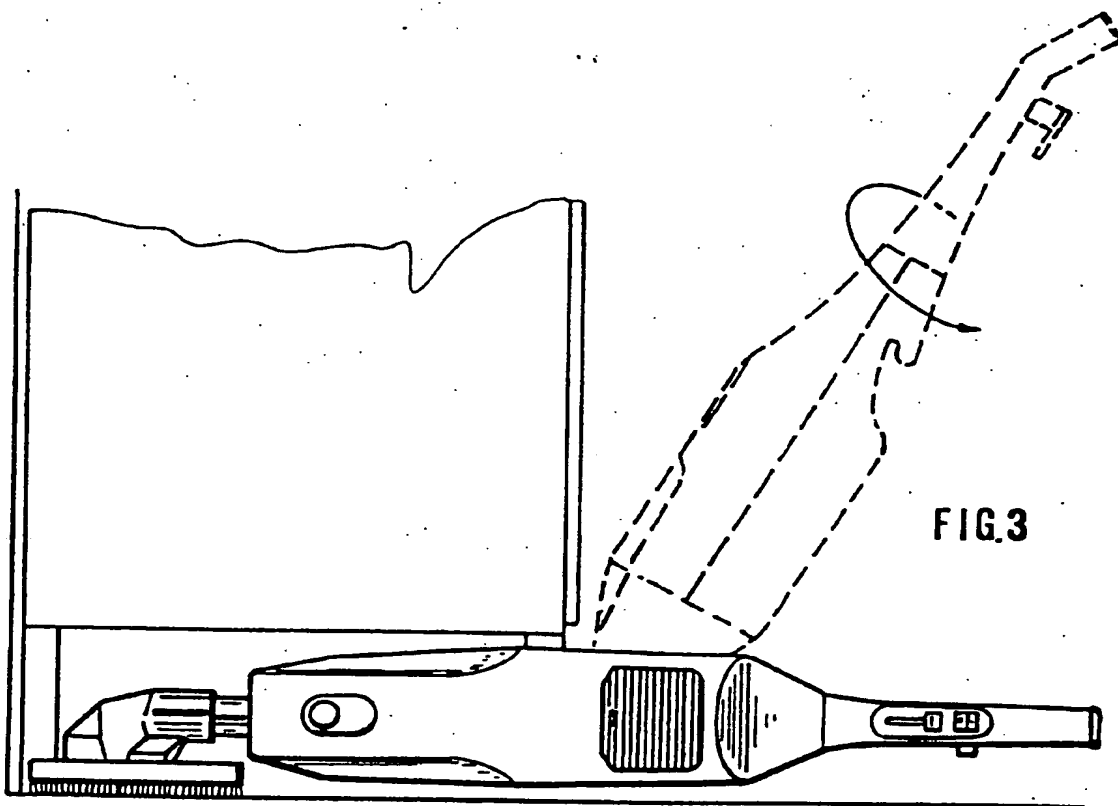


FIG. 3

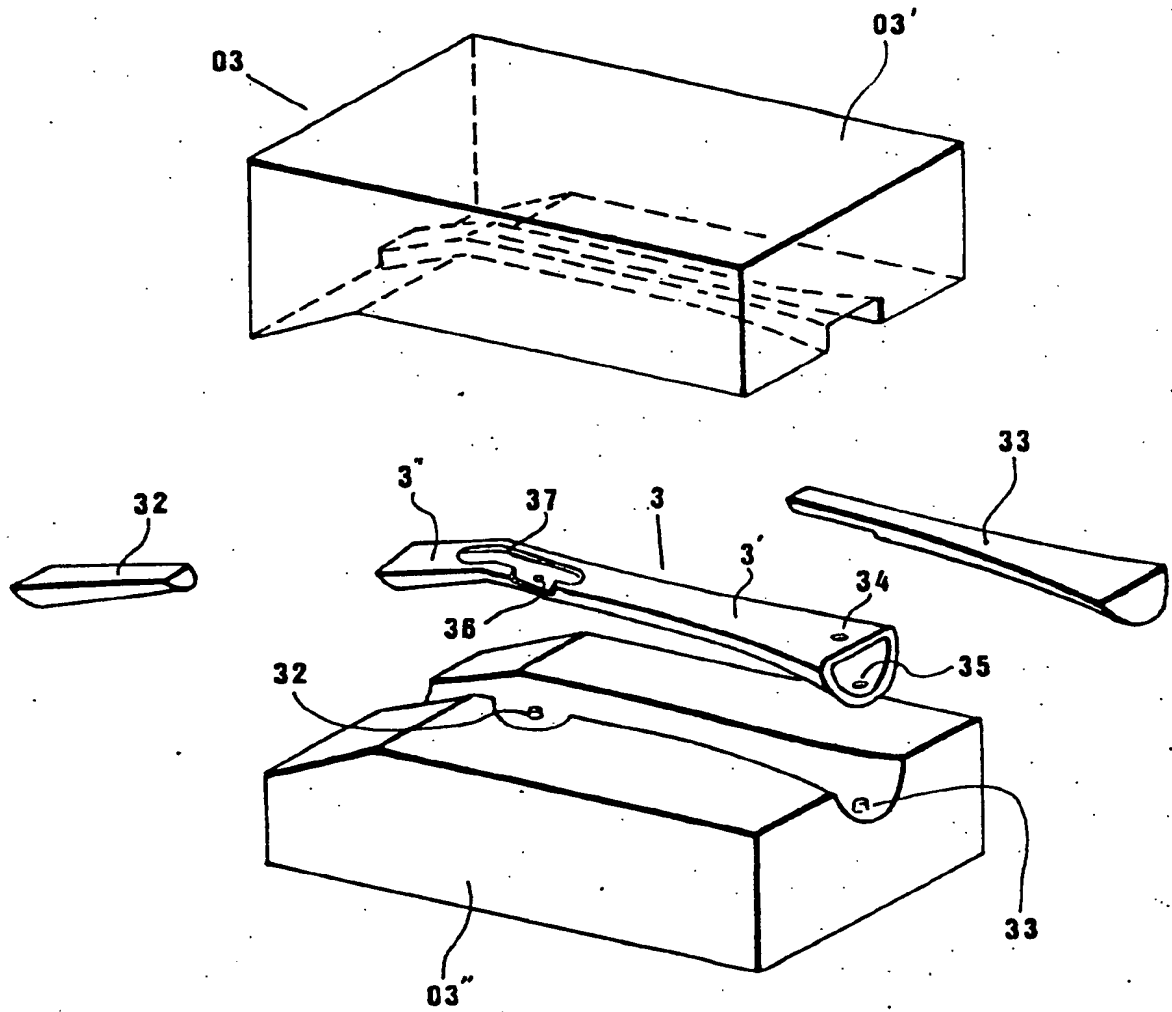
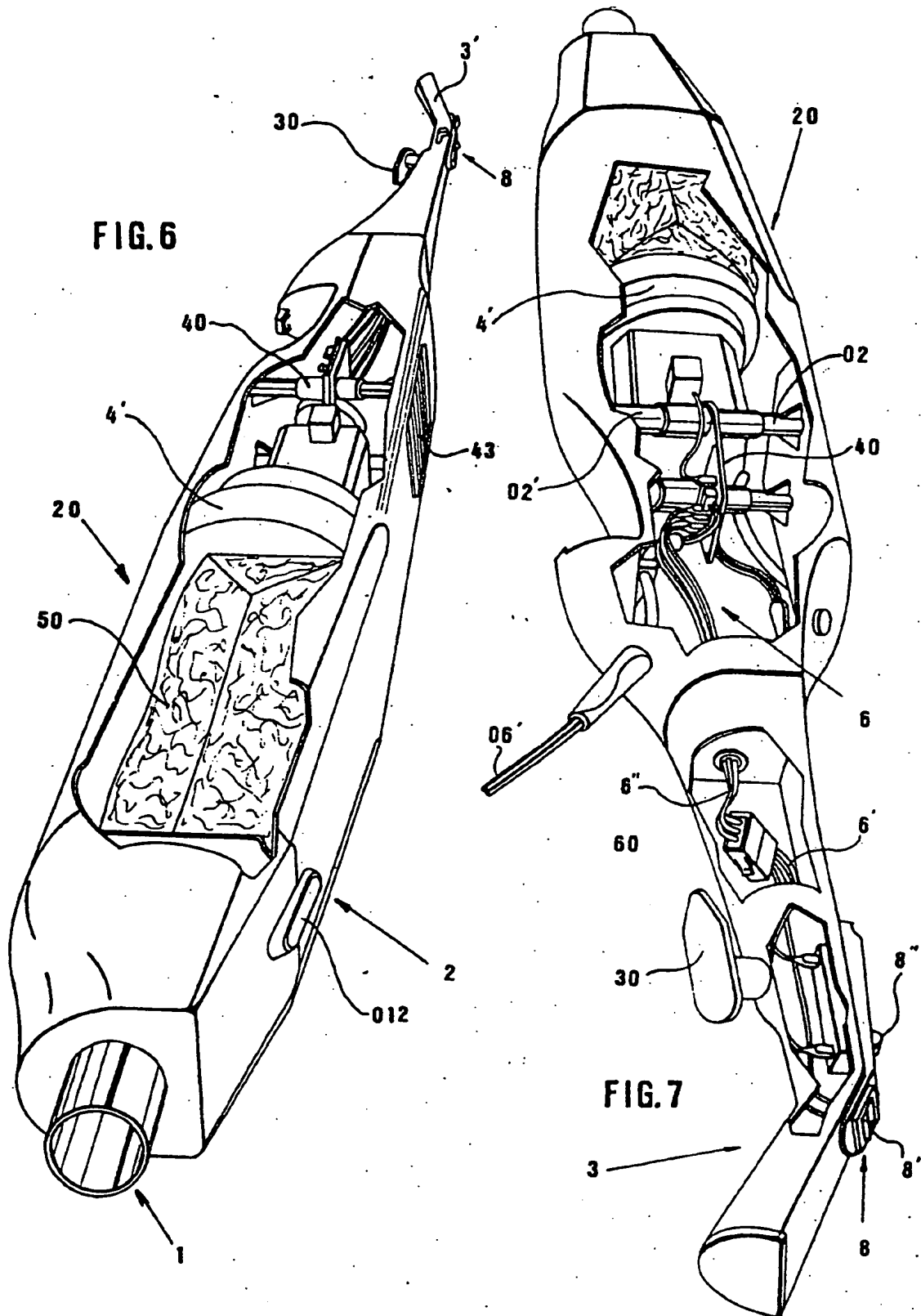


FIG. 5



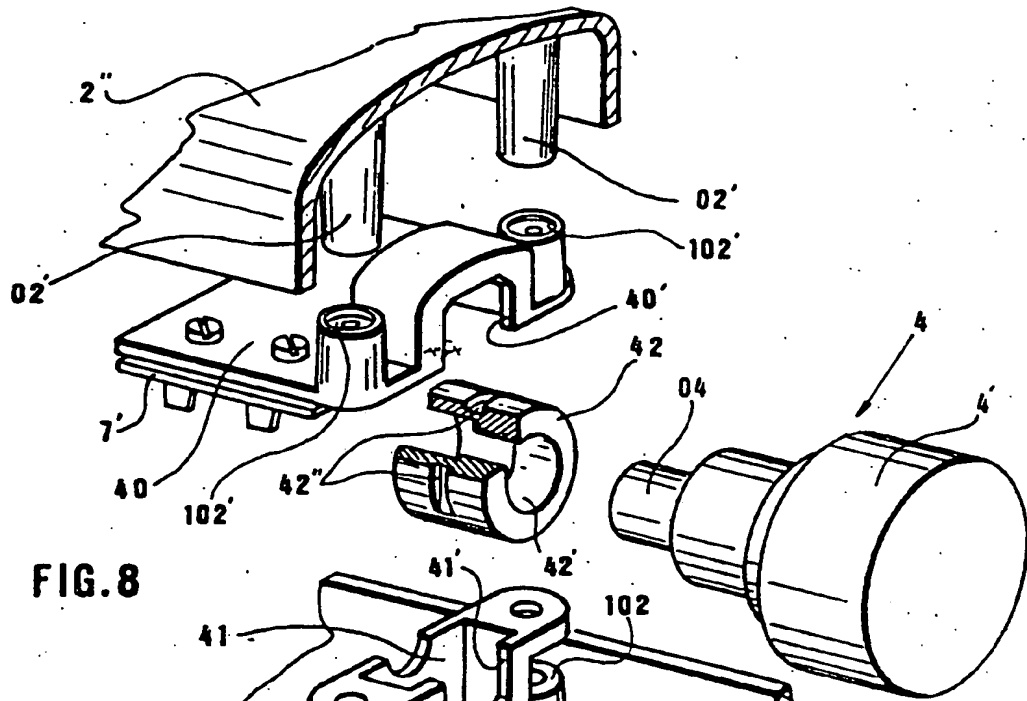


FIG. 8

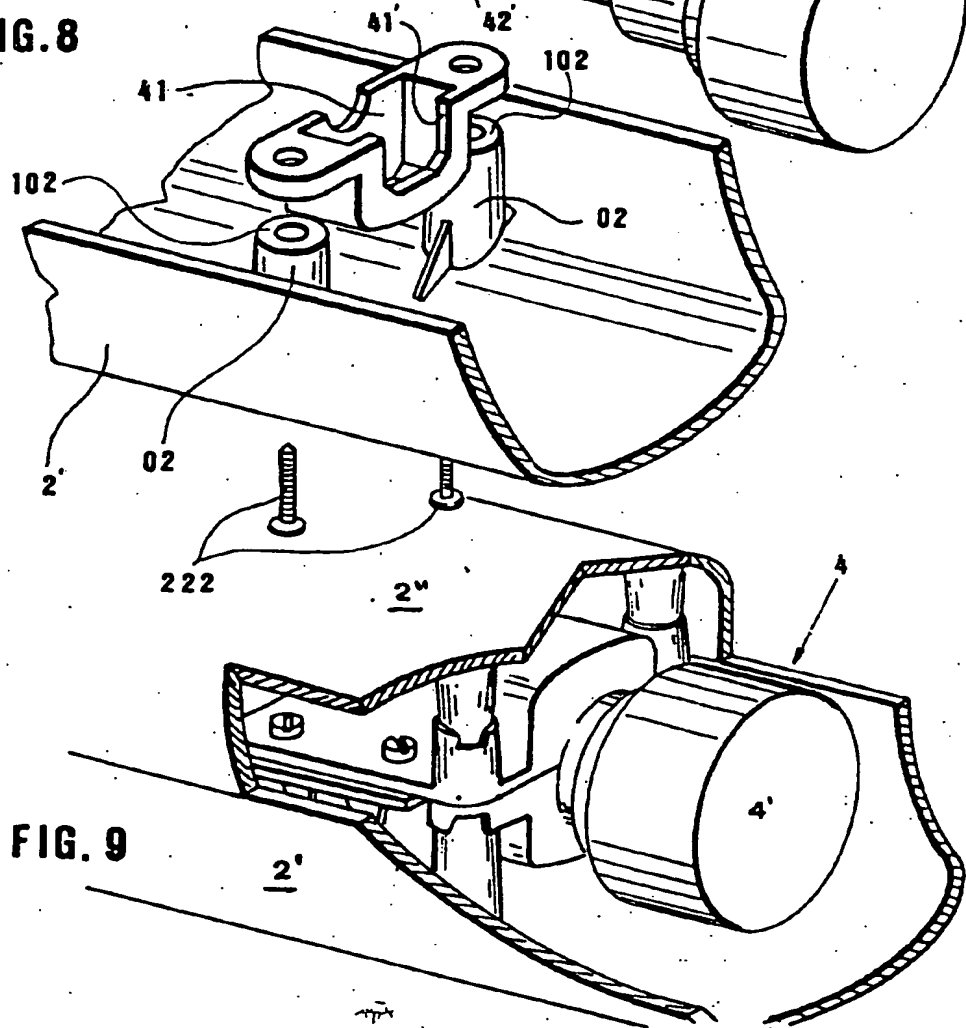


FIG. 9